UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/743,379	12/23/2003	Kazuyoshi Chikugo	ASAIN0135	6961

24203 7590 12/17/2007
GRIFFIN & SZIPL, PC
SUITE PH-1
2300 NINTH STREET, SOUTH
ARLINGTON, VA 22204

EXAMINER	
KEMMERLE III, RUSSELL J	
ART UNIT	PAPER NUMBER
1791	
MAIL DATE	DELIVERY MODE
12/17/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/743,379	CHIKUGO, KAZUYOSHI	
	Examiner	Art Unit	
	Russell J. Kemmerle	1791	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 October 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2 and 5-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 2, 5-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 112

In view of the amendment filed on 05 October 2007 the rejection of the previous Office Action under 35 USC §112 are withdrawn.

Claim Rejections - 35 USC § 103

Claims 1, 2, 5-7 and 9-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vail (Ceramic Structures by Selective Laser Sintering of Microencapsulated, Finely Divided Ceramic Materials) in view of Osawa (US Patent 5,702,501), Baek (US Patent 6,444,600), Gonczy (US Patent 4,615,875) and Kaneko (US Patent 3,919,755).

Vail discloses a method of selective laser sintering a polymer coated ceramic powder in order to form a ceramic green article (i.e., powder lamination) (pp 125-126), and infiltrating the green article with a ceramic cement and then firing the infiltrated green article (page 126). Specifically mentioned is the use of oxide ceramics (specifically silica, zircon and alumina) (pg 125). Vail further discloses using a ceramic cement that is primarily colloidal silica, or a silica/alumina mixture (page 125 and Table 3). Colloidal silica and alumina is known to be an inorganic binder (see for example, Baek, Col 1 lines 61-63 using colloidal silica and alumina as an inorganic binder).

Vail further discloses that after infiltrating the sample with ceramic cement, the samples are dried, polymer binders are removed, and infiltrated samples are fired at high temperatures up to around 1000°C (page 126 and Fig. 1).

Vail does not disclose that the samples are fired in an atmosphere of 1100°C or more, or that the impregnated core is placed in a heat resistant powder during firing.

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have modified the method disclosed by Vail of firing infiltrated oxide ceramic articles at 1000°C by firing the samples at 1100°C or higher. This would have been obvious because one skilled in the art would know that while 1000°C is generally sufficient for treatment of a silica sol as discussed in Vail, for other materials such as alumina sol a temperature of at least 1100°C is required to convert the sol to α-alumina (see for example, Gonczy, Col 4 lines 58-60 disclosing that unseeded alumina sol must be heated to 1200°C to effect phase transformation to α-alumina).

Osawa discloses a method of burying an article in a ceramic powder during heating and sintering to prevent the article from deforming (Col 2 lines 23-44).

Neither Vail nor Osawa disclose that the impregnation occur in a pressure reduced vessel.

Kaneko discloses a method of infiltrating a ceramic article with colloidal silica (see example 2, Col 3 line 10-Col 4 line 5), including where the impregnation occurs in a vacuum (i.e., a reduced pressure) (Col 2 line 31).

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have modified the method taught by Vail of using selective

laser sintering to form a ceramic article, by using the method disclosed by Osawa of firing an article while it is buried in a ceramic powder in order to prevent the article from deforming during firing. It would have been further obvious to have perform the impregnation step in a vacuum (i.e., in a reduced pressure vehicle) as taught by Kaneko, since Kaneko discloses that such a process is known, and that by impregnating in a vacuum it is known that more air can be removed from the molded object, allowing better impregnation by the liquid.

Referring to claims 6 and 12, it is known that the amount of time required to complete an impregnation step is dependant on many factors, including, but not limited to, the size of the article to be impregnated, the viscosity of the impregnating liquid, the force applied pulling the liquid into the article (i.e., how much the pressure in the vessel is reduced), and the degree of impregnation desired among other factors. It would be within the knowledge of one of ordinary skill in the art to manipulate such parameters in order to complete the impregnation step in about 5-10 minutes.

Claims 8 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vail in view of Osawa, Baek, Gonczy and Kaneko in further view of Gartland (US Patent 4,986,333).

Vail, Osawa and Kaneko are relied upon as discussed above, but fail to teach where the ceramic core is confined in wax, and a heat-resistant shell is then formed around the ceramic core confined in wax.

Gartland discloses a mold having a core to be used in metal casting. Making the mold involves first forming a ceramic core (similar to the core discussed above) which is

then encased with wax, with a ceramic (i.e., heat-resistant) shell then formed around the wax (Col 2 lines 6-14).

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have modified the method taught by Vail in view of Osawa and Kaneko as discussed above by taking the ceramic core formed and encasing it in wax, then further surrounding a ceramic shell around the encased core as taught by Gartland. This would have been obvious because Gartland discloses that this is a known and effective method of using a ceramic core to cast a metal object.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vail in view of Osawa, Baek, Gonczy and Kaneko, in further view of Leyden (US Patent Publication 2004/0,038,009)

Vail, Osawa, Baek, Gonczy and Kaneko are relied upon as discussed above, specifically in the rejection of claim 1, but fail to teach that the ceramic powder is coated with a phenol resin that thermally decomposes at 200-400°C.

Leyden teaches a method of rapid prototyping or selective laser sintering a three-dimensional body where a cross linking agent (i.e., the resin covering the ceramic powder) is a phenol resin (see Claim 2), which would inherently decompose in the range of 200-400°C.

Thus, it would be obvious to one of ordinary skill in the art at the time of invention by applicant, to modify the methods discussed above, by using a phenol resin as a coating on the ceramic powder since Leyden teaches that it is one of finite known possible choices which can be successfully used for such a process. Further, as

discussed above the body is heated to a high temperature according to the teaching of the other references to sinter the body, this would include heating the body through 200-400°C which would decompose the resin film.

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vail in view of Osawa, Baek, Gonczy, Kaneko, and Leyden in further view of Gartland.

Vail, Osawa, Baek, Gonczy, Kaneko, and Leyden are relied upon as discussed above, and the additional limitation of current claim 16 is taught by Gartland as discussed above in the rejection of claim 8.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vail in view of Osawa, Baek, Gonczy, Kaneko, Leyden and Gartland in further view of Frank (US Patent 6,494,250)

Vail, Osawa, Baek, Gonczy, Kaneko, Leyden and Gartland are relied upon as discussed above, but do not teach that the oxide ceramics reinforcing liquid is yttrium oxide sol, niobium oxide sol, or a combination of the two.

Frank teaches an alumina based core for use in an investment shell mold in the casting of molten metals and alloys where the core is impregnated with yttia to improve core creep resistance (abstract). Specifically mentioned is using yttria sol (see Col 4 lines 55-64, as well as other places throughout the disclosure).

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant to modify the method as taught and discussed above, by impregnating the ceramic body with yttria sol as taught by Frank. This would have been

obvious because Frank teaches that this results in a mold with improved core creep resistance.

Response to Arguments

Applicant's arguments have been fully considered but they are not persuasive.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant first points out eight limitations of the current claims which Vail does not teach. As discussed above in the rejections, it is not argued that Vail teaches those eight limitations, but instead that those limitations are taught by the secondary references, as they are applied above in the rejections under 35 USC §103

Applicant argues that Osawa teaches away from from the current invention because it discloses that burying a body to be sintered in ceramic powder requires a great amount of energy and may result in uneven sintering. This does not constitute teaching away because Osawa discloses that it was known to bury a body in ceramic powder during sintering in order to prevent the body from deforming. Disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. In re Susi, 440 F.2d 442, 169 USPQ 423 (CCPA 1971).

Applicant further argues that Osawa does not teach or suggest "sintering the impregnated ceramic core" at any temperature. That is not what Osawa is relied upon for. Osawa is relied upon to teach that the use of burying a body in a ceramic powder during firing to prevent deformation.

Applicant further argues that Osawa fails to teach seven of the eight points recited previously under the arguments regarding Vail. Since it is not alleged that Osawa teaches any of those points these arguments will not be addressed.

Applicant argues that Kaneko does not teach an impregnated core used for casting. Again, this is not what the reference is relied upon for teaching. Kaneko is relied upon for teaching that it was known to infiltrate a ceramic article with colloidal silica using a vacuum to assist in drawing the liquid into the article. This is used to show that when infiltrating a ceramic body with a colloidal silica, one skilled in the art would know that this step could occur in a vacuum.

Applicant next argues that "the examiner has not established that requisite ceramic porosity and binder viscosity characteristics meriting the selection of impregnation in a vacuum have been satisfied." This is not found to be persuasive because there is not singular ceramic porosity and binder viscosity for which vacuum assisted impregnation is suitable. Rather vacuum assisted impregnation will always result in a faster impregnation of a body do to the drawing out of the air from the pores of the ceramic body.

Applicant again argues that Gonczy does not pertain to any kind of ceramic and has no relevance to the current subject matter. As in the previous response, applicant

again mischaracterizes the alumina of Gonczy as a metal. As pointed out in the previous action alumina is a common name for aluminum oxide (Al_2O_3), a common ceramic material in industrial use, this is different than aluminum which is a metal. Despite the applicant's assertion that "a person of ordinary skill in the art would know that the 'alpha phase' is a structure of a metal and not of a ceramic", this statement is simply not true. As those skilled in the art understand alumina to refer to a ceramic material, they also understand that the alpha phase of alumina is one of the most common crystal structures of the ceramic material alumina. Thus, as pointed out in the previous Office Action, Gonczy concerns the temperatures at which the ceramic material alumina must be heated to to achieve a finished body.

Applicant next argues that Baek "fails to make up any of the deficiencies" of the other references. Baek is relied on simply to teach that known inorganic binders include colloidal silica and alumina, which it does and does not appear to be contested by the applicant.

Applicant argues that the examiner has employed too many references to form a mosaic in an attempt to impermissibly recreate a facsimile of the claimed invention.

In response to applicant's argument that the examiner has combined an excessive number of references, reliance on a large number of references in a rejection does not, without more, weigh against the obviousness of the claimed invention. See *In re Gorman*, 933 F.2d 982, 18 USPQ2d 1885 (Fed. Cir. 1991).

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that

any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Applicant argues that one of ordinary skill in the art would not be motivated to combine Vail and Kaneko since that would inefficiently result in a sintering step both before and after impregnation. This is again not true, as impregnation processes often involve multiple sintering steps. In order to impregnate a ceramic body it must have sufficient strength to withstand the process, and sufficient porosity to absorb the impregnating liquid. Both of these are characteristics that a ceramic body typically will not have until after it has been sintered, and then a second sintering step would be required for the impregnated phase. One of ordinary skill in the art would not find this overly inefficient, but instead simply the process needed to create the desired article.

Applicant requested proof that he amount of time required to complete an impregnation step depended on many factors including those recited by the examiner in this and the previous Office Action. The examiner includes with this action a copy of a paper by Garcia-Cordovilla et al discussing infiltration (impregnation), which discussed the factors which influence the infiltration process including the volume fraction of the solid (i.e., open porosity), the viscosity of the liquid, experimental conditions (pressure,

time, temperature, etc) as well as other factors (see page 4462, section 2.1 The experiment).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russell J. Kemmerle whose telephone number is 571-272-6509. The examiner can normally be reached on Monday through Friday, 8:30-4:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on 571-272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RJK/

R Crispino

RICHARD CRISPINO
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700